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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Process to Manufacture Pre-Cured Tread and Vulcanizable Rubber Compound

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ABSTRACT

An improved Process to Manufacture pre-cured treads to rebuild tire treads and the improved vulcanizable rubber composition for use in such process in which it is essentially foreseen self-adhesive to: (a) arrange a layer of self adhesivo vulcanizable rubber composition having from 65% to 75% of natural rubber, from 15 to 30% of strengthening mineral pigments and from 10 to 15% of curing chemical reactants, onto the lower face of the crude tread body to be bonded to the tire body, before the pre-curing of the tread body , (b) putting a protective plastic sheet under the said vulcanizable rubber layer and (c) pre-curing in a vulcanizing press the said tread structure formed by the tread body, the said lower vulcanizable rubber layer and the said lowermost protective plastic sheet, thus obtaining a pre-cured tire tread element which may be vulcanized and bonded onto a tire carcass,from which the workout original tread was removed, specification.

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IMPROVED PROCESS TO MANUFACTURE PRE-CURED TREAD AND VULCANIZABLE RUBBER COMPOUND

The present invention relates to an improved process to manufacture pre-cured tread structures to replace worn out tire treads on a pneumatic carcass of a pneumatic tire to be restored in local tire repairing shops, as well as to a vulcanizable rubber compound to be applied under said tread belt.

It is known by the art such as disclosed in the Brazilian Patent Application S/N P.I 8806122 (corresponding to US patent application 393,126 filed on August 14, 1989) to improve the bonding of a pre-cured tread body into the smoothed surface of a pneumatic tire to be restored upon the full removal of the worn out tire tread, in which the whole lower side of the tread body is provided with corrugations obtained in the pre-curing process of the tread body by means of a sheet of course cloth embodied into the said lower face during the pre-curing stage in the vulcanizing press, the said piece of cloth being stripped off before applying the layer of bonding material and then submitting the tire body and the adhering new pre-cured tire tread to final vulcanization, in the tire repair shop.

In fact, the said operation of firstly incorporating the piece of fabric onto the lower face of the tread body through its pre-curing, during the manufacture of the tire tread unit to be supplied to the tire repair shops may give cause to some drawbacks due to the need of having the piece of cloth stripped from the tread body to reveal the resulting corrugations embossed into the lower surface thereof by the pressed rough cloth, at the very moment the new tread unt is to be bonded to the carcass of the tire on which the restoration of the

tread is to be performed.

A layer of proper bonding material is then applied on the said wrinkled lower surface of the tread body, filling in all the grooves and a portion of time is to be spent for the bonding fluid to dry out. Only then a rubber connecting layer is placed between the tread and the tire body to start the vulcanization of the tread structure.

In some places, like in the United States, the manufacturer does strip the piece of cloth therefrom soon after its pre-curing and then does apply the adhesive layer on the currugated surface and then shields it off against oxidation by means of a plastic sheet.

In all cases, though, the said state of the art by which the embossement of the bonding surface of the tread body is carried out by means of a piece of rough fabric, shows the main disadvantageous feature of not allowing a mass production on account of the huge loss of time resulting from the manual steps of:

a - aligning and superimposing the extruded tread body on the sheet of rough cloth;

b - taking the two superimposed but still separate parts, to the pre-curing press for the molding of the tread unit;

c - stripping off the piece of cloth soon after the pre-curing;

d - applying a layer of bonding material on the bonding, corrugated lower face of the tread body; and

e - putting a protective plastic sheet to wrap the said lower face, to prevent oxidation of the adhesive layer during its storage.

The exposure to potential oxidation of the adhesive layer is a disadvantageous feature that hampers the feasibility of the said known process, both under technical and economical viewpoints,

even when counting with the re-usability of the stripe of rough cloth.

It is so the main scope of this invention to improve the said known process through the dropping of the use of the embossing stripe of rough cloth and of the filling in of a layer of liquid adhesive, thus enhancing the production of the tread bodies by the elimination of the time consuming operations of putting in place and removing the piece of cloth and of applying the oxidizable adhesive layer.

Through intense research applicant has eventually found out what now is disclosed as the main object of this invention, that all the said disadvantageous features may be wiped out by substituting the adhesive liquid layer, whose application has demanded the corrugation of the tread body bonding face and preventing the use of a stripe of tough fabric, by a self-adhesive, vulcanizable rubber layer which may easily bond the tire tread onto the smooth surface of a tire carcass to be restored in which the said self-bonding layer is compounded by 65 to 75% of natural rubber, 15 to 30% of strengthening mineral pigments and 10 to 15 % of vulcanization reactants.

The improved process of this invention consists of :

(a) preparation of a layer of self-bonding, vulcanizable rubber composition made of 65 to 75% of natural rubber, 15 to 30% of strengthening mineral pigments selected among carbon black and silica , alone or combined, with the alternative adding of pigment dyes, and from 10 to 15% of chemical reactants of vulcanization selected among sulphur, thiurans, zinc oxides, sulfonamides and stearic acid;

(b) aligning ans superimposing the tread body on a stripe of the said rubber composition, with the same width

(c) wrapping the said self-bonding lower layer with a thermoplastic protetive sheet and

(d) submitting the said tread structure to pre-curing in a vulcanizer press.

Its is thus obtained an out of the press ready to sell and use tread units which are delivered to the tire repair shops where by easily tearing off the protective plastic sheet, the unit being arranged as usual, on the known connecting layer placed on the smooth bonding face of the tire carcass, the whole set being then vulcanized.

As an alternative way to carry out the improved process of this invention the said protective plastic sheet may be wrapped around the said self-bonding rubber layer after the pre-curing of the tread structure, by mechanical means instead of by thermal adherence in the pre-curing stage.

The plastic protective sheet is selected among those neutral materials which do not interact with the self-bonding rubber layer, being selected among polyester plastic films, polyethylene film and polyester textile sheets.

Yet another alternative way to carry out the process of this invention consists of:

(a) pre-curing the tread body alone;

(b) applying on the bonding face thereof by any available means, like by thermofixing in an autoclave, the said self-bonding rubber layer and

(c) wrapping of the said lower layer on the said plastic sheet

Through the laboratory test, ASTM/D-413 it was measured a 20% increase of the adhesiveness of the tread structure to the tire carcass when compared with the state of the art process as disclosed in the Patent Application BR/ 8806122. By the said test a restored tire having a tire tread replaced in accordance with this invention, endured an air pressure between 80 and 100 p.s.i without showing any disengagement or loosening of any portion of the tire tread section.

The same lab test carried out on a restored tire having the tire tread fastened in accordance with the process disclosed in the said BR -8806122 patent application, reveled an endurance between 70 and 80 p.s.i.
Under international standards of quality , the said figure is set at a minimum level of 60 p.s.i what stresses the high performance and the unexpected superior results obtained with the proces of this invention.
As a further advantageous feature it may be stressed the fact that by dropping the use of the chemical adhesive layer, the storing time is substantially lengthened provided that the risk of oxidation is no longer to be taken into account.

WHAT IS CLAIMED IS

1. An process improved of manufacture of a pre-cured tread body to be bonded to a tire carcass , without using textile means to corrugate the bonding face of the tread body and without the use of chemical adhesive layer filling in the grcoves on the said surface, cousisting of:
- preparing a rubber body having a lower smooth bonding face
- pre-curing the said rubber body in a vulcanizer press to wold its upper, working surface, into a tire tread.
- bonding the said tread body onto a tire carcass by means of vulcanizable intermediate connecting rubber layer and
- vulcanizing the resulting assembly,characterized by the fact that it consists of:
(a) a vulcanizable self-adhesive rubber composition layer is prepared, being compounded by 65 to 75% of natural rubber 15 to 30% of strengthening mineral pigments and by 10 to 15% of chemical reactants of vulcanization having the same width of the tread body;
(b) the tread body is then aligned and superimposed on the said self-adhesive layer
(c) the said self-adhesive rubber layer is then wrapped by a lowermost protective plastic film and
(d) the tread assembly is then submitted to pre-curing in a vulcanizer press to obtain a ready -to - usJ tire tread for replacing the worn out treads of restorable tires.

2. The process as per claim 1 in which alternatively the said wraping lower plastic film is arranged on place by mechanical roller means after the pre-curing of the tread body with the associated self-adhesive layer.

3. An improved process of manufacture of a pre-cured tread body to be bonded to a tire carcass without using textile means to corrugate the bonding face of the tread body and

without the use of chemical adhesive layer filling in the grooves on the said surface, consisting of:
- preparing a rubber body having a lower smooth bonding face,
- pre-curing the said rubber body in a vulcanizer press to mold its upper working surface, into a tire tread,
- bonding said tread body onto a tire carcass be means of a vulcanizable intermediate connecting rubber layer, and,
- vulcanizing the resulting assembly characterized by the fact that it consists of:
(a) preparing a vulcanizable self-bonding rubber sheet compoundeed by 65 to 75% of natural rubber , 15 to 30% of strengthening mineral pigments and by 10 to 15% of chemical reactants of vulcanization having the same width of the said tread body
(b) alighmin and superimposing the said pre-cured tread body on the said self - bonding rubber sheet
(c) fastening the said lower layer to the supeimposed pre-cured body by heating the assembly in an autoclave and
(d) wrapping up the said lower layer with a protective plastic sheet applied by means of mechanical roller means

4. The process as per claim 1,2 and 3 in which the said strengthening mineral pigments are selected among carbon black and silica alone or combined.

5. the process as per claim 4 in which to the carbon black and silica it may be added pigment dyes.

6. The process as per claim 1 and 2 in which the said reactants of vulcanization are selected among sulphur, sulfonamides, thiurans, zinc oxides and stearic acid.

7. The process as per claim 1 and 2 is which the said protective plastic film is selected among polyester plastic, polyethylene sheets and poliester fabric.